

# PATENT SPECIFICATION

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## (54) DISPENSING CLOSURES

(71) We, METAL BOX LIMITED, of Queens House, Forbury Road, Reading RG1 3JH, Berkshire, a British Company, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to tip-sealing dispensing closures. By "tip-sealing dispensing closures" is meant, throughout the Specification, closures adapted for dispensing liquid products such as creams, pastes or gels under pressure from a container; at their exit or discharge end such closures include a sealing arrangement which is operative when the pressure is removed to automatically effect a seal isolating the product from atmosphere and preventing the sucking-back of air into the container.

A primary object of the present invention is to provide a tip-sealing dispensing closure which combines simplicity and suitability for mass-production manufacture with reliability in operation.

Aspects and features of the invention will become apparent from the following description of two embodiments thereof, given by way of example and with reference to the accompanying drawings. In the drawings:

Figure 1 shows a first closure in accordance with the invention, as seen in diametral section along the line I-I of Figure 2 when the closure is in its non-operative or relaxed condition;

Figure 2 is an underplan view of the first closure as seen in the direction of the arrow A in Figure 1.

Figure 3 is a view similar to Figure 1 of the closure during dispensing of product; and

Figure 4 is a view similar to Figure 1 of the second closure when non-operative and fitted with an overcap.

Referring now to Figures 1 and 2, a squeeze tube for a food product in paste or cream form has a conventional squeezable body 10 and an end closure 11 push-fitted with a central spigot 12.

The squeezable body is typically made from a cut length of extruded plastic tubing which is closed at its bottom end at a fin seal formed by heat-sealing or radio frequency welding together opposed halves of the tube periphery. For clarity the tube bottom end is omitted from

Figure 1. If desired the body may be of laminated structure; for example, it may include a layer of metal (e.g. aluminium) foil between layers of plastic material.

The top end of the body 10 is closed by the end closure 11 which is of circular outline, having its periphery defined by a conical annular skirt 31 the free edge of which is intimately bonded to the top free edge of the body as, for example, by spin-welding.

In Figure 1 the bond between the body 10 and closure 11 is shown and generally denoted by the reference numeral 13.

In addition to the skirt 31 the end closure 11 includes a hollow bellows 14, and a thickened and generally plane annular portion 15 which carries the skirt on its outside periphery. The bellows extends integrally and axially from the free inner edge of the portion 15, on the convex side of the skirt 31. At its end remote from the portion 15 the bellows is partially closed at 16 to leave a central circular opening 17.

The whole end closure 11, formed of the various parts 14 to 16 and 31, is a single piece plastic moulding made by an injection blow moulding process. It is believed that many plastic materials, in particular low or high density polyethylene, or PVC, or polypropylene, maybe possible for the end closure.

It will particularly be noted that the bellows 14 is of much thinner material than the skirt 31 and thickened portion 15, so that whereas the latter two parts can be considered as rigid, the bellows is flexible and, in particular, is extensible along its axis. The reason for this flexibility will later become apparent. Although the bellows 14 has two corrugations, other numbers of corrugations more than one (e.g. 3) are possible.

The spigot 12 is a plastics moulding having a solid cylindrical shank portion 20 with an enlarged integral head 21 at its lower end. The head 21 is circular, and to mount the spigot in position is tightly push-fitted into a recess 22 formed on the underside of the thickened portion 15 around the central bore of the latter. From the head 21 the shank portion 20 extends centrally along the bellows 14 to a free distal end 24 which projects just beyond the closed end 16 of the bellows when the device is non-operative as shown in Figure 1. The diameter of

the shank portion 20 is the same as, or slightly greater than, that of the opening 17 in the bellows, so that a substantially air-tight seal is then formed between the spigot and the bellows.

As can be clearly seen from Figure 2, the spigot head 21 around the shank portion 20 is formed with three segmental passages 23 communicating the interior of the squeezable body 10 with the interior of the bellows 14. When, therefore, in use the body 10 is squeezed by the user, product is forced under pressure to move from the body into the interior of the bellows. In response to the pressure which the product exerts upon it, the bellows extends axially until its end 16 moves beyond the free end of the shank portion 20 of the spigot 12 as shown in Figure 3, and product is thereby enabled to pass through the opening 17 for use as desired.

When the required amount of product has been dispensed the pressure on the body 10 is relieved by the user, and the pressure of the product in the bellows falls approximately to zero. By virtue of its natural resilience, the bellows then returns to its relaxed condition of Figure 1, so remaking the seal with the spigot 12 and isolating the remaining product in the body 10 and bellows 14 from atmosphere. If, at any time, a negative pressure subsequently develops in the body, for example, by virtue of its own natural resilience, the end 16 of the bellows moves further down the shank portion 20 and the seal is still maintained.

By thus providing a seal isolating the product from atmosphere when the squeeze tube is not in use, the tip-sealing dispensing closure formed of the items 11 and 12 substantially reduces hardening or discolouration of oxygen-sensitive products such as tomato ketchup or ready-made mustard; moreover, by acting as a one-way valve preventing air from being sucked into the tube after dispensing it enables a body 10 of substantial natural resilience to be used, there being no need to provide the body with good dead-fold properties.

Figure 4 shows a modification of the first embodiment in which the corrugations of the bellows, rather than being separate in the form of parallel rings, are continuous with one another in a helical, thread-like configuration. This enables a moulded plastic screw cap 30 with a screw-thread formation 32 to be screwed directly onto the bellows to provide mechanical protection and resistance against oxygen permeation. The cover has an annular bead 33 formed on the underside of its top panel 34 to engage the top of the bellows end 16 around the shank portion 20 and so help to prevent escape of product during transit, handling, etc.

In a further, non-illustrated, modification of the first embodiment the thickened portion 15 is raised above the skirt 31 to form an upstanding generally cylindrical boss having the bellows 14 rooted on its inside periphery. The cylind-

rical exterior surface of the boss is formed with screw threads for engagement by screw threads formed around the bottom free edge of a moulded plastics cap having a bead identical in arrangement and function to the bead 33 in Figure 4. Thus it will be seen that the non-illustrated screw cap which serves the same or similar function as the screw cap 30 of Figure 4, is attached for use to the rigid part of the closure 11 rather than to the flexible bellows 14 as in Figure 4. The attachment of the cap to the squeeze tube is thereby made more secure.

In a non-illustrated variation of each of the arrangements described above, the opening 17 in the bellows 14 is somewhat smaller in diameter than the shank portion 20 and adapted to make sealing engagement with the latter at a chamfer around its free end 24.

If desired, the shank portion 20 may be arranged to provide lateral support for the bellows to prevent the latter from buckling sideways intermediate its ends. To this end it is arranged, if such buckling occurs, to engage with the elbow or elbows formed in the bellows interior at the junction(s) between the successive rings or corrugations of the bellows.

In a modification of each of the described embodiments the elbow or elbows 40 formed between the bellows rings or corrugations lie on substantially the same diameter as the opening 17 so as to be a sliding or clearance fit on the shank portion 20, the shank portion itself being of cruciform cross-section where it corresponds to the elbow or elbows to allow product to pass to the opening.

#### WHAT WE CLAIM IS:

1. A tip-sealing dispensing closure, which comprises a generally rigid annular portion for peripheral attachment to a container to be closed and having an opening for product to pass from the container for dispensing, a hollow flexible bellows having a plurality of corrugations and secured to the annular portion at one end so as internally to receive said product passing through the opening, the end of the bellows opposite the said one end being partially closed and formed with a dispensing aperture, the closure further comprising a spigot attached at the said one end of the bellows and having a shank which extends along and within the bellows to a distal end arranged to close the dispensing aperture by forming a seal with the partially closed end of the bellows, the arrangement being such that when, in use, the closure is attached to a product-containing said container, pressure generated within the product in the container and communicated via the opening to the bellows interior causes the bellows to extend and so carry the partially closed end thereof out of sealing engagement with the spigot to allow product dispensing through the dispensing aperture, the bellows contracting resiliently to remake the seal when the pressure is subsequently removed.

2. A closure according to Claim 1, wherein

- the spigot is attached to the annular portion of the closure at an enlarged head portion which is push-fitted into a recess formed on the side of the annular portion remote from the bellows, the shank portion being formed integrally with the head portion and extending from the head portion and through the opening in the annular portion to its distal end.
3. A closure according to Claim 2, wherein one or more passages are formed through the head portion for the passage of product through the opening.
4. A closure according to any preceding Claim, wherein at least at its distal end the shank portion is of constant cross-section which substantially corresponds dimensionally to the dispensing aperture, whereby when the seal is made the partially closed end of the bellows may move along the shank portion to accommodate any negative pressure generated within the product.
5. A closure according to any Claim of Claims 1 to 3, wherein the distal end of the shank portion is formed with a chamfer at which to make sealing engagement with the partially closed end of the bellows.
6. A closure according to any preceding Claim, wherein the annular portion and the bellows are integrally formed as a one-piece plastics moulding by an injection blow moulding process.
7. A closure according to any preceding Claim, wherein the bellows has a plurality of corrugations in the form of separate rings arranged in parallel relation along the bellows.
8. A closure according to any Claim of Claims 1 to 6, wherein the bellows has a plurality of corrugations which are continuous with one another in a helical, thread-like configuration.
9. A closure according to Claim 7 or Claim 8, wherein the shank portion is arranged to provide lateral support for the bellows by engagement with an elbow or elbows formed in the bellows interior at the one or more junctions between the corrugations.
10. In combination, a closure according to Claim 8 and a closure cap enclosing the bellows and attached thereto by screw threads engaging the bellows exterior.
11. A closure according to any Claim of Claims 1 to 9, which has screw threads formed around the said one end of the bellows for engagement by complementary screw threads on a closure cap enclosing the bellows.
12. In combination, a closure according to Claim 11 and a said closure cap screwed on to the closure at the said screw threads thereof.
13. A combination as claimed in Claim 10 or Claim 12, wherein the closure cap comprises a top panel and a peripheral skirt depending from the top panel and interiorly formed with the said screw threads, the top panel engaging the partially closed end of the bellows to maintain the same in sealing engagement with the shank portion.
14. A combination as claimed in Claim 13, wherein the top panel of the closure cap engages the partially closed end of the bellows by means of a projecting annular bead disposed to encircle the dispensing aperture.
15. A closure substantially as herein described with reference to Figures 1 to 3, or Figure 4 of the accompanying drawings.
16. A combination of closure and closure cap, substantially as herein described with reference to Figures 1 to 3, or Figure 4 of the accompanying drawings.

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COMPLETE SPECIFICATION

2 SHEETS

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Sheet 1

FIG. 1

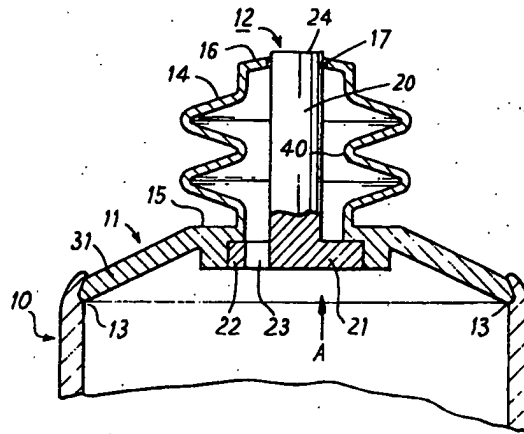
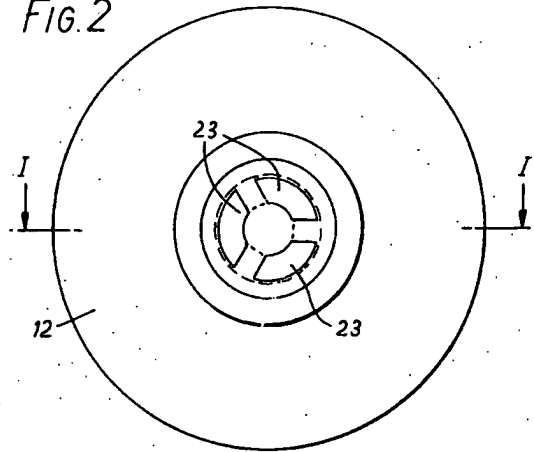


FIG. 2



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Sheet 2

FIG. 3

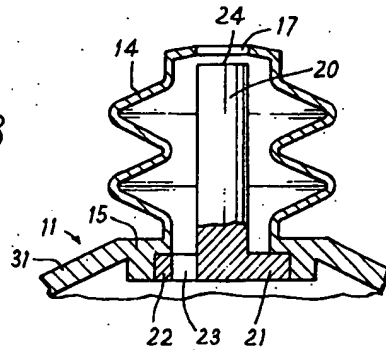


FIG. 4

